1 485 989

PATENT SPECIFICATION

(11) 1 485 989

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(72) Inventors STANLEY PORRITT and JOHN SCOTT ALLINSON

(19)

(54) FILTER WITH BACKFLUSHING DEVICE

(71) We, PLENTY GROUP LIMITED, formerly Plenty & Son Limited, a British Company of Hambridge Road, Newbury, RG14 5TR, Berkshire, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to filtering apparatus and particularly to apparatus of the kind having a drum-shaped pervious body adapted to support a layer of filter material through which fluids are passed to filter them.

It has previously been proposed to provide such filter devices with an axially-mounted rotatable arm with a head arranged to sweep the inside surface of the drum for the purpose of cleaning the filter material of accumulated debris. This gives rise to problems in the case of large filters, because the internal surface of the drum must be accurately made to ensure that the head keeps in contact with it, as the arm rotates. This problem becomes particularly acute if the drum is of an elongate cylindrical shape, which is a shape which is preferred from the point of view of ease of fabrication.

A filter in accordance with the invention comprises a housing enclosing a perforate elongate drum adapted to support a filter material and two or more arms mounted for rotation within the drum about the axis of the drum, each arm having an elongate head which is so designed as to be resiliently biased into engagement with the drum over substantially the whole length of the head, the heads being angularly displaced from one another, respective heads being arranged to sweep different overlapping portions of the internal cylindrical surface of the drum, each arm having a passage through which fluid may flow when the filter material is to be cleaned by reversal of the normal flow through the part of the filter material which is in fluid communication with the interior of its respective head. The reversal of flow is known as "backflushing."

The use of at least two arms with their heads arranged to sweep different portions of the internal surface of the drum, enables the surface to be closely swept and minimises the problem caused during backflushing, if the cylinder is not wholly true, by leakage of fluid into the arm from the interior of the drum which has not passed through the filter. Such irregularities of the cylinder may be caused if the inner wall of the drum is made from a rolled-up sheet of perforated stainless steel.

The arms are preferably mounted on and their passage connected to a central rotatable hollow duct into which fluid flows from the arms when backflushing is taking place.

A filter material which may be advantageously used with a filter of this type is polypropylene felt (made by a needlefelting process) which can withstand high reverse pressures without disintegrating, and in this case the filter element comprising two concentric cylindrical walls is used, with the felt mounted between, the inner wall having perforations in which the dirt may be collected.

The heads of the backflushing arms are preferably provided with elongate sealing pads along their edges which may, for example, be formed from cloth-reinforced phenolic resin. This material has the advantage that it exhibits a low coefficient of friction against stainless steel and is not subject to attack by most chemicals. The sealing pads themselves may be individually spring-loaded so as securely to engage the internal surface of the drum.

The apparatus is preferably arranged for a forward pressure difference across the filter material of 4—5 p.s.i. under filtering flow but allowing for up to 15 p.s.i., or even 30—40 p.s.i. in extreme cases in the reverse direction so as to ensure that the filter material is thoroughly cleaned. This kind of pressure difference can be sustained by the

preferred polypropylene felt material although it would destroy conventional woollen felts.

The sealing arrangement of the heads of the backflushing arms may take various forms as alternatives to the basic arrangement of plain strips of plastics material, fixed along the edges of rectangular heads. For example, each head may incorporate a slotted roller device which rolls around the inside surface of the filter drum as the arm rotates, fluid flowing through the filter material and through the slots in the roller device.

The arms themselves may be mounted on the backflushing duct using a central spring-loaded mounting or alternatively they may be spring-mounted at both ends. In either case the arrangement is preferably such that the arm can rock about a substantially central point, so as to compensate for unevennesses in the internal surface of the drum.

The invention will now be described by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an axial cross-section through a filter assembly in accordance with the invention;

Figure 2 is a cross-section on the line II—II of Figure 1;

Figure 3 is a diagrammatic view of a modified backflushing arm which can be fitted to the assembly of Figure 1; and

Figure 4 is an enlarged cross-section on the line IV—IV of Figure 3.

Referring to Figures 1 and 2, the apparatus comprises an elongate housing 2 in which is mounted a filter drum 4. The filter drum has a double wall comprising an inner perforate cylinder 6 and an outer perforate cylinder 8, the filter material being held between the two walls.

The normal path of fluid to be filtered is through an inlet 10, down into the drum 4 in the direction of arrows A, out through the filter material in the direction of arrows B, and thence to an outlet duct 12. Debris filtered from the fluid is retained in the filter material and in the perforations (not shown) in the inner wall 6 of the filter drum. The filter material is preferably a polypropylene felt made by a needlefelting process.

When it is required to flush the debris out of the filter material a valve 14 is opened which connects the interior of an axial backflushing duct 16 to atmosphere. The pressure within the housing 2 then causes fluid to flow back through portions of the filter drum which are in fluid communication, through arms 20, with the duct 16. The duct 16 is rotatable about its axis and when backflushing takes place it is rotated by means of a motor 18 mounted at its outer end.

Rotation of the duct causes the backflushing arms 20, which are connected to the duct, to sweep around the internal surface of the filter drum. Three such arms are incorporated in this embodiment of the invention, one at each end of the filter drum and the other, displaced angularly by 180° from the other two, covering the central area. The areas swept by the arms are arranged to overlap. Each arm is mounted on the central duct, as indicated at 22 in each case, by a radially-outwardly extending sprung hollow member which communicates with the interior of the duct and with an axially elongate head 24 of the arm.

Each axially extending side edge of each head incorporates a sealing strip 26 of cloth-reinforced phenolic resin, the strips being fixed in position in the head by suitable bolts and spacers 28 (Figure 2). The outer edge of each sealing strip is chamfered as shown at 30 so as to fit accurately against the inner curved surface of the filter drum wall 6.

Referring to Figures 3 and 4, each collector head comprises a generally channel-section member 32 having a single strip 34 of phenolic resin-bonded material fixed across its open side rather than two spaced strips as shown in Figure 2. This strip is formed with a longitudinally extending slot 36 through which accumulated debris from the filter material can be carried.

The member 32 is connected to the central rotatable duct 16 by means of a spring mounting generally indicated at 38 comprising a short tube 40 connected at its outer end to the member 32 and at its inner end passing loosely through a hole 41 in the duct wall. The tube 40 is biased to the normal position shown by a spring 42 held between the tube 40 and a fixed collar 44 surrounding the tube. The spring 42 is positioned between the surface of the duct 16 and the inner face of the channel 32 and acts to urge the head against the inside surface of the drum. As can be seen in Figure 3, each end of the channel member 32 is held in a strap 46 mounted on the duct, the engagement between the channel and duct being as shown in the left hand side of Figure 2. A peg 48 extending from a plate closing the open end of the channel engages in a slot 50 at the end of the strap 46. This allows the head to rock slightly to take up irregularities in the drum.

The filter is designed to operate with a forward filtering pressure difference across the filter material of 4—5 p.s.i. in normal use, but allowing for up to 15 p.s.i. or even 30—40 p.s.i. in extreme cases in the reverse direction so as to ensure that the filter material is thoroughly cleaned.

An alternative arrangement of the

collector head (not shown), incorporates a roller device which rolls around the inside surface of the filter drum as the arm rotates, fluid flowing through the filter material and through slots in the roller device.

WHAT WE CLAIM IS:—

1. A filter comprising a housing enclosing a perforate elongate drum adapted to support a filter material and two or more arms mounted for rotation within the drum about the axis of the drum, each arm having an elongate head which is so designed as to be resiliently biased into engagement with the drum over substantially the whole length of the head, the heads being angularly displaced from one another, respective heads being arranged to sweep different overlapping portions of the internal cylindrical surface of the drum, each arm having a passage through which fluid may flow when the filter material is to be cleaned by reversal of the normal flow through the part of the filter material which is in fluid communication with the interior of its respective head.

2. A filter as claimed in Claim 1 wherein the arms are mounted on and their passages connected to a central rotatable hollow duct.

3. A filter as claimed in Claim 1 or 2 wherein the drum comprises two concentric cylindrical walls, and comprising a layer of felt as filter material, mounted between the walls, the inner wall having perforations in which the dirt may be collected.

4. A filter as claimed in any of Claims 1 to 3 wherein each head is provided with an elongate sealing pad along the outer edge of the head.

5. A filter as claimed in Claim 4 wherein each sealing pad is formed from cloth-reinforced phenolic resin.

6. A filter as claimed in Claim 3 wherein the felt is formed from polypropylene and made by a needlefelting process.

7. A filter as claimed in Claim 4 or 5 wherein each pad is individually spring loaded so as to engage the internal drum surface.

8. A filter as claimed in any one of Claims 1 to 3 or 6 wherein each head incorporates a roller device arranged to roll around the inside surface of the drum, fluid being enabled to flow through the filter material and through slots in the roller device.

9. A filter substantially as described with reference to the accompanying drawings.

For the Applicants:
LLOYD WISE, BOULY & HAIG,
Chartered Patent Agents,
Norman House,
105—109 Strand,
London, WC2R 0AE.

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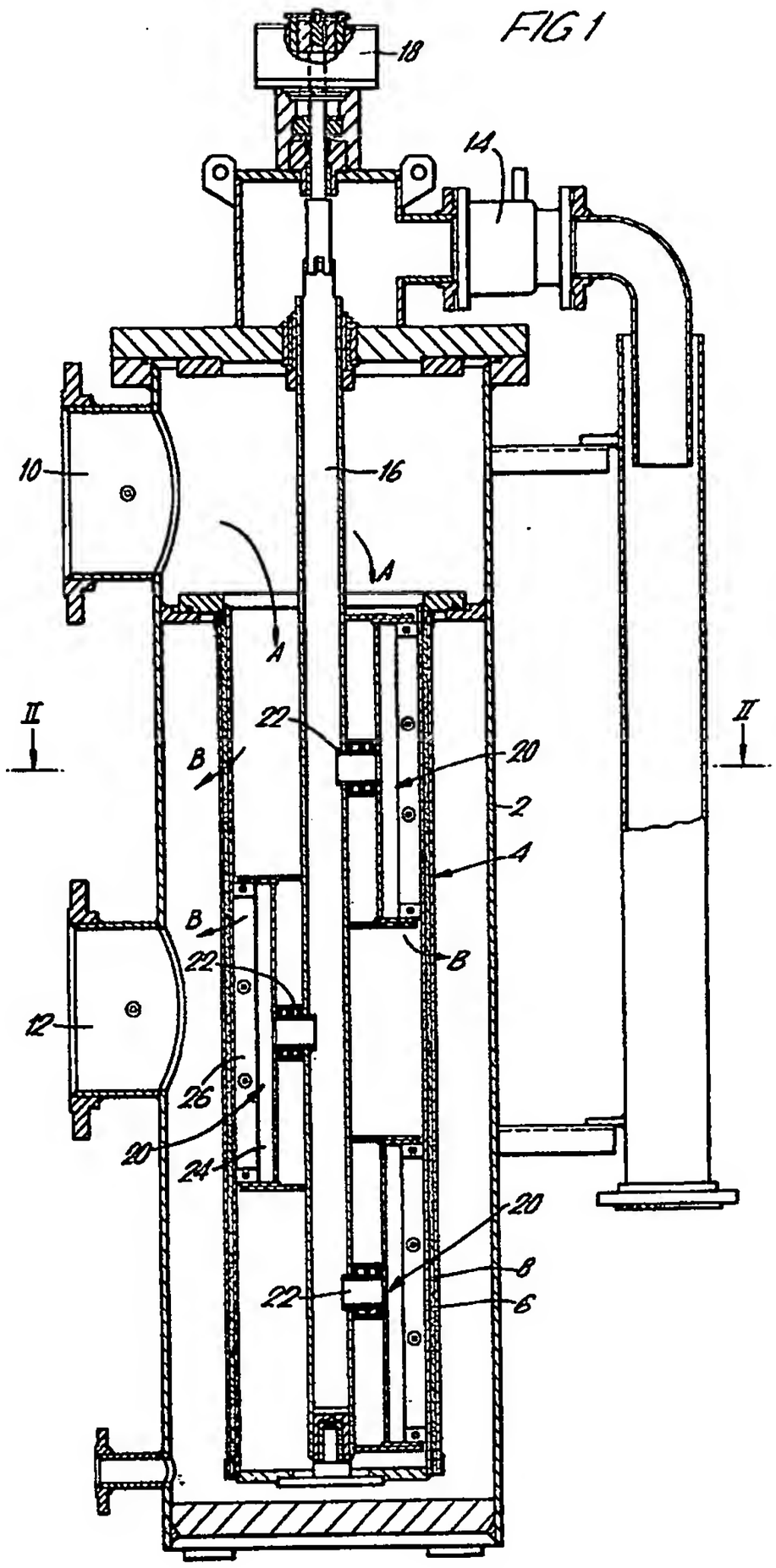
Sheet 1

FIG 1



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Sheet 2

FIG. 2.

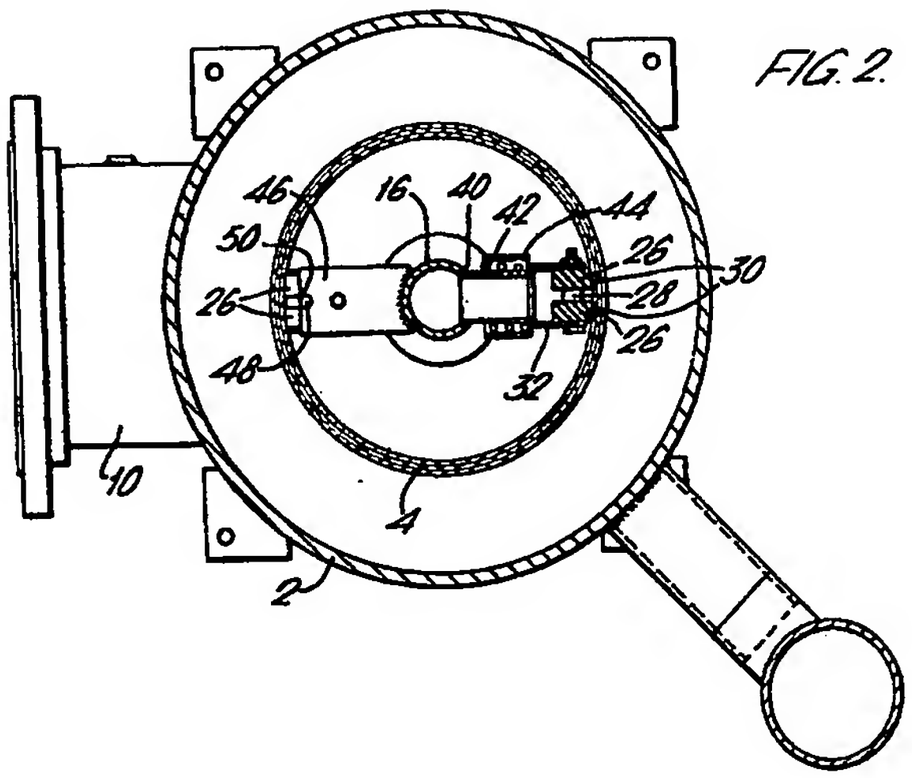
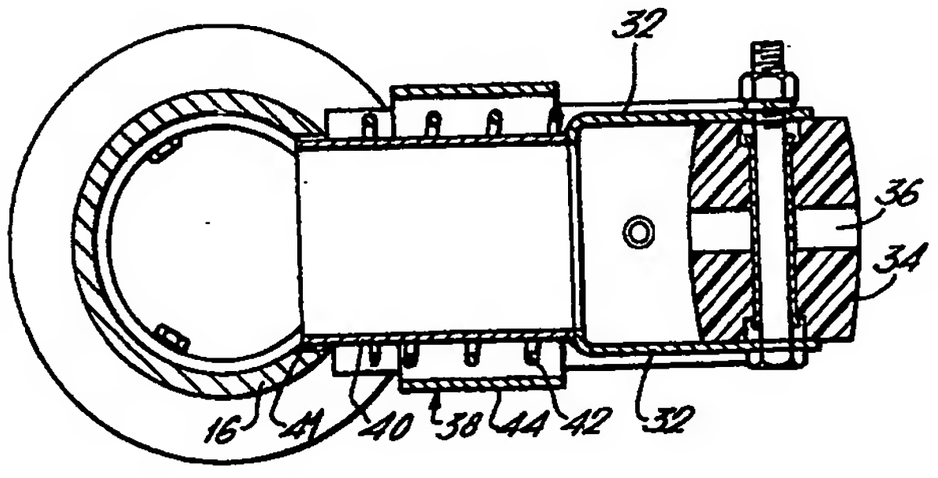


FIG. 4.



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Sheet 3

FIG. 3.